An Introduction to ScaLAPACK

Outline:

- Introduction
- Applications
- ScaLAPACK Functionality
- Software Hierarchy and Interfaces
- ScaLAPACK User Interface
- Performance
- Afternoon: Hands-ON

Hands-On

http://acts.nersc.gov/scalapack/hands-on

Hands-On Exercises for ScaLAPACK

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Introduction

These exercises provide basic and more advanced programming instruction for writing parallel programs calling the BLACS, PBLAS, and ScaLAPACK. A basic knowledge of Fortran, parallel programming with message-passing, and MPI is assumed. Some of the exercises also require an understanding of two-dimensional block cyclic data distribution.

Exercises 1 and 2 give an introduction to parallel programming with the Basic Linear Algebra Communication Subprograms (BLACS). Exercises 3, 4, and 5 provide a range of simplistic to more complex parallel programs calling PBLAS and ScaLAPACK.

The instructions for the exercises assume that the underlying system is an IBM SP; using up to six processes that do message-passing. These example programs use MPI as the underlying message-passing layer. These hands-on exercises were prepared in collaboration with the University of Tennessee, based on contributions from A. YarKhan, C. Hastings, S. Blackford, C. Whaley, A. Petitet and O. Marques.

Exercise 1: BLACS - Hello World Example
Exercise 2: BLACS - Pi Example
Exercise 3: PBLAS Example
Exercise 4: ScaLAPACK - Example Program 1
Exercise 5: ScaLAPACK - Example Program 2
Various: A collection of additional exercises and examples.

Addition Resources:

- Block Cyclic Data Distribution
- Useful calling sequences
- **Detailed information on the BLACS**
- **Detailed information on the PBLAS**
- **Detailed information on ScaLAPACK and more examples**
- Download all exercises

- Do a“cp –r /usr/common/acts/SCALAPACK/hands-on hands-on”.

- There are sixsubdirectories under hands-on:
  - Example1:BLACS“helloworld”example
  - Example 1: BLACS, hello world example
  - Example 2: BLACS, “pi” example
  - Example 3: PBLAS example
  - Example4:ScaLAPACKexample1(PSGESV)
  - Example 4: ScaLAPACK example 1 (PSGESV)
  - Example 5: ScaLAPACK example 2 (PSGESV)
  - Additional exercises

- Examples 1-5 are written in Fortran. For a successful compilation and execution of Example 5, you will have to correct some lines in the code, in particular the lines starting with *** (commented lines).

- Examples 1-5 can be compiled with “make”, which will generate an executable file with “.x”.

- Try alsohttp://acts.nersc.gov/scalapack/hands-on/datadist.html with a bigger matrix and different block/grid sizes.